

## TEACHERS' RETIREMENT BOARD

### INVESTMENT COMMITTEE

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SUBJECT: Stochastic Asset / Liability Study – Follow up

ITEM NUMBER: 6

ATTACHMENT: 1

ACTION: \_\_\_\_\_

DATE OF MEETING: June 4, 2003

INFORMATION: X

PRESENTERS: Christopher J. Ailman  
Mark Johnson, Milliman U.S.A. and Allan Emkin, PCA

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#### Policy

The asset allocation to the plan is covered by the overall CalSTRS Investment Policy and Management Plan. This stochastic study also touches on the actuarial assumptions used by the internal and external actuaries.

#### Executive Summary

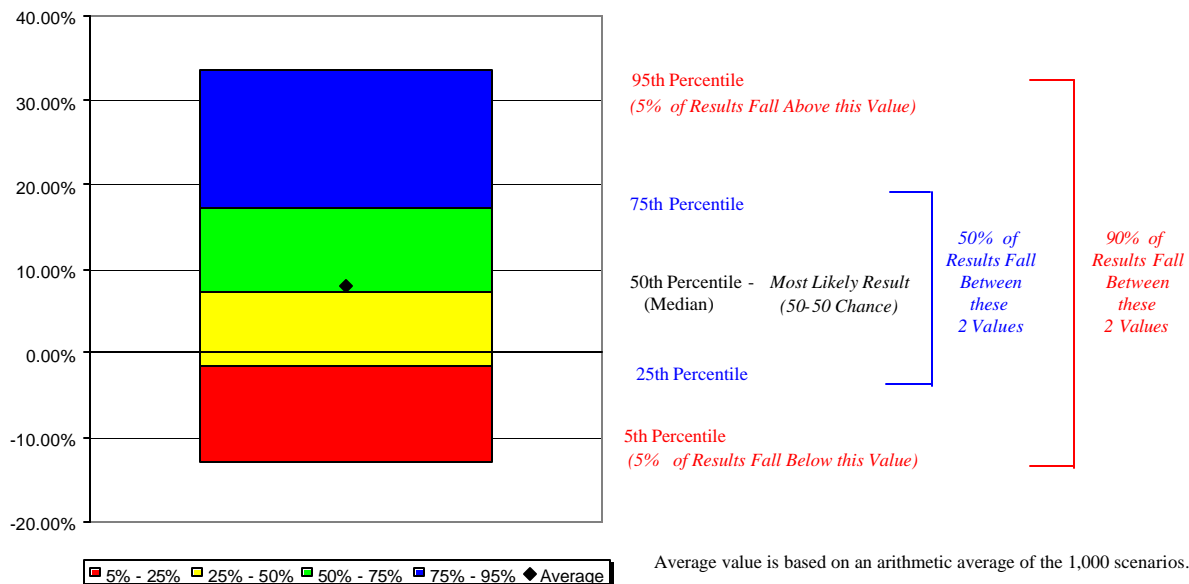
In late 2002, the Investment Committee decided to engage Pension Consulting Alliance and Milliman U.S.A. to produce a comprehensive stochastic asset liability study. At the December 4, 2002 meeting, the Committee adopted new capital market assumptions for input to the model. Milliman then ran thousand of economic scenarios to test the assets and liabilities. The initial findings of this Monte Carlo simulation were presented at the February 5, 2003 meeting. Numerous questions arose from the simulations about the inflation assumptions and different starting at a different point in time. As a result, Milliman prepared an additional series of reports which are labeled Attachment 1. This is not the final step of the study. Additional questions should be developed for future stochastic runs at subsequent meetings. The tentative plan is to continue modeling different inputs into the fall of this year. The end purpose of this study will to determine whether changes are needed in the current asset allocation or funding policy.

#### Background

One of the Board's key goals is "Goal 5, Advance policies and practices that ensure a financially sound retirement system while exploring opportunities for innovation." Two of the key objectives within this goal are to review the asset allocation and liability stream and evaluate the assumptions in the current market environment. To fulfill these objectives, and with concern over the prolonged bear market and the potential of low single digit future investment returns, the Board commenced this robust stochastic asset/liability study. The purpose of this study is to estimate the effect of the current asset allocation on the DB Program's funded status and the adequacy of the contributions.

At the February meeting, PCA and Milliman Global presented a series of charts based on the new CalSTRS capital market assumptions. These charts displayed the expected financial status of the fund within a 90 percent range. The initial findings looked at the long-term outcomes based upon our current asset allocation policy and the potential variation in returns out to the year 2011. These returns could then be used to look at the effects on funded status and the adequacy of contribution rates. In all, 1000 scenarios were run to set the expected range. The liabilities were assumed fixed for the ten-year period. In consideration of the current State budget difficulties, additional scenarios can be developed assuming changes to the nature and pattern of our liabilities.

The results of 1,000 projected scenarios are sorted from highest to lowest values and summarized by percentiles:



The Committee will recall the results shown on a color coded bar chart displayed above. The yellow and green bars represent the 25<sup>th</sup> to 75<sup>th</sup> percentile or half of the potential outcomes. Human nature and the press, have a tendency to jump to the extremes of the top and bottom ranges. The bottom red section covers the 25<sup>th</sup> to 5<sup>th</sup> lowest outcomes and the top blue section shows the top 75<sup>th</sup> to 95<sup>th</sup> percentile on the positive side. Note that individually those ranges only represent one fifth of the potential outcomes over the next ten years. In addition, there is a 10 percent probability the outcome will exceed the entire range. Our members, stakeholder groups, and the public must understand that this is a study that will develop over several meetings and no one should jump to conclusions based on the interim / draft reviews. Our goal at this meeting will be to develop an additional set of options to model at a future meeting.

### Discussion

If you look at a pension plan as a water bucket, there are two water faucets pouring into the bucket. One faucet is the income from the investment portfolio; the other is the employers and employee contributions. The tap at the bottom pours out benefit payments. In this analogy, the expenses of the plan are the evaporation out of the bucket. Ideally a Board strives to keep the bucket at 80 to 100% filled or funded. These stochastic runs display what would happen in the future if the investment is slowed down or opened wider. The charts show what happens to the water level, i.e. the funded status of the plan, and the contribution rates, the other inflow into the bucket. At this meeting, the triumphant of staff, PCA and Milliman has developed several different scenarios to simulate decreases and in one case an increase in the investment faucet.

The latest Milliman stochastic runs have five different scenarios.

- 1) The first is the last run from the February meeting.  
One of the key findings was the mismatch for the liability assumed inflation rate of 3 ½ percent versus the investment inflation assumption of 2 ½ percent.
- 2) The second set of runs, set both the liability and investment inflation rate at 3 ½ percent.
- 3) This run simulated a low investment return environment. We lowered the expected return for U.S. and Non-U.S. equities as well as the return for private equity and real estate. In this environment the overall investment portfolio would not generate on average enough return to meet the actuarial assumed rate of 8%.
- 4) In contrast, this run simulated a high investment return environment. Similar to the periods of strong returns like the 1950's and 1980's, we assumed U.S. and Non-U.S. stocks would earn a double digit 10.25% return. Likewise we assumed a higher return for private equity, real estate and a slightly better, albeit small, return for fixed income and inflation protected securities (TIPS).
- 5) In this last run we held the return assumptions static at our current expectations, as used in run 1 and 2, and we moved the asset allocation to a more conservative 50% equity and 50% debt split.

Each of these runs is intended as a draft, not an exhaustive or conclusive study. These serve as a discussion point to consider altering the inputs and assumptions used by the model. Run number 2, as described above will serve as the base case for all comparisons. At the meeting Allan Emkin, Mark Johnson, and staff will primarily contrast runs 3,4, and 5 with run number 2. Clearly the projections using a low investment return environment and a more conservative asset allocation put more pressure on the funded status of the plan and the contributions rates. It can not be emphasized enough for the audience and constituent groups that these runs only serve as an example. Readers should not jump to any conclusions about the potential future contribution rates or funded status. As in all financial advertisements, we must say, "Future results will vary."



**Milliman** USA

Attachment 1

Investment Committee – Item 6

June 4, 2003



# Asset/Liability Study

## Return and Allocation Scenarios

June 4, 2003



# *Focus for today*

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- Deterministic Projections
  - Review results with an 8% investment return
- Stochastic Projections
  - Scenario 1: 2.5% inflation
  - Scenario 2: 3.5% inflation
  - Scenario 3: Low investment return environment
  - Scenario 4: High investment return environment
  - Scenario 5: Conservative asset allocation



# *Deterministic Projection*

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- Baseline from June, 2001 actuarial valuation
- Projected Financial Results
  - Uses one set of assumptions for all years
  - Uses actual return for year ended June, 2002
- Projected annually to June 30, 2011
  - No change in assumptions
  - No gains or losses
  - Statutory contribution rate remains unchanged



# *Deterministic Projection Results*

Fiscal Year Ending	Asset Return	<u>Valuation Projections, Beginning of FY(\$billions)</u>				30-Year Contrib. Rate
		Actuarial Assets	Actuarial Obligation	Unfunded Act. Oblq.	Funded Ratio	
2002	-5.9%	\$108	\$110	\$2	98.0%	17.1%
2003	8.0	108	118	9	92.1	18.8
2004	8.0	111	126	15	88.1	20.1
2005	8.0	114	134	20	85.3	21.1
2006	8.0	119	143	24	83.1	21.9
2007	8.0	125	153	28	81.7	22.5
2008	8.0	131	163	32	80.5	23.0
2009	8.0	137	173	35	79.5	23.5
2010	8.0	144	183	39	78.7	23.9
2011	8.0	151	194	43	77.9	24.3
2012	8.0	159	206	47	77.3	24.6



# *Stochastic Projections*

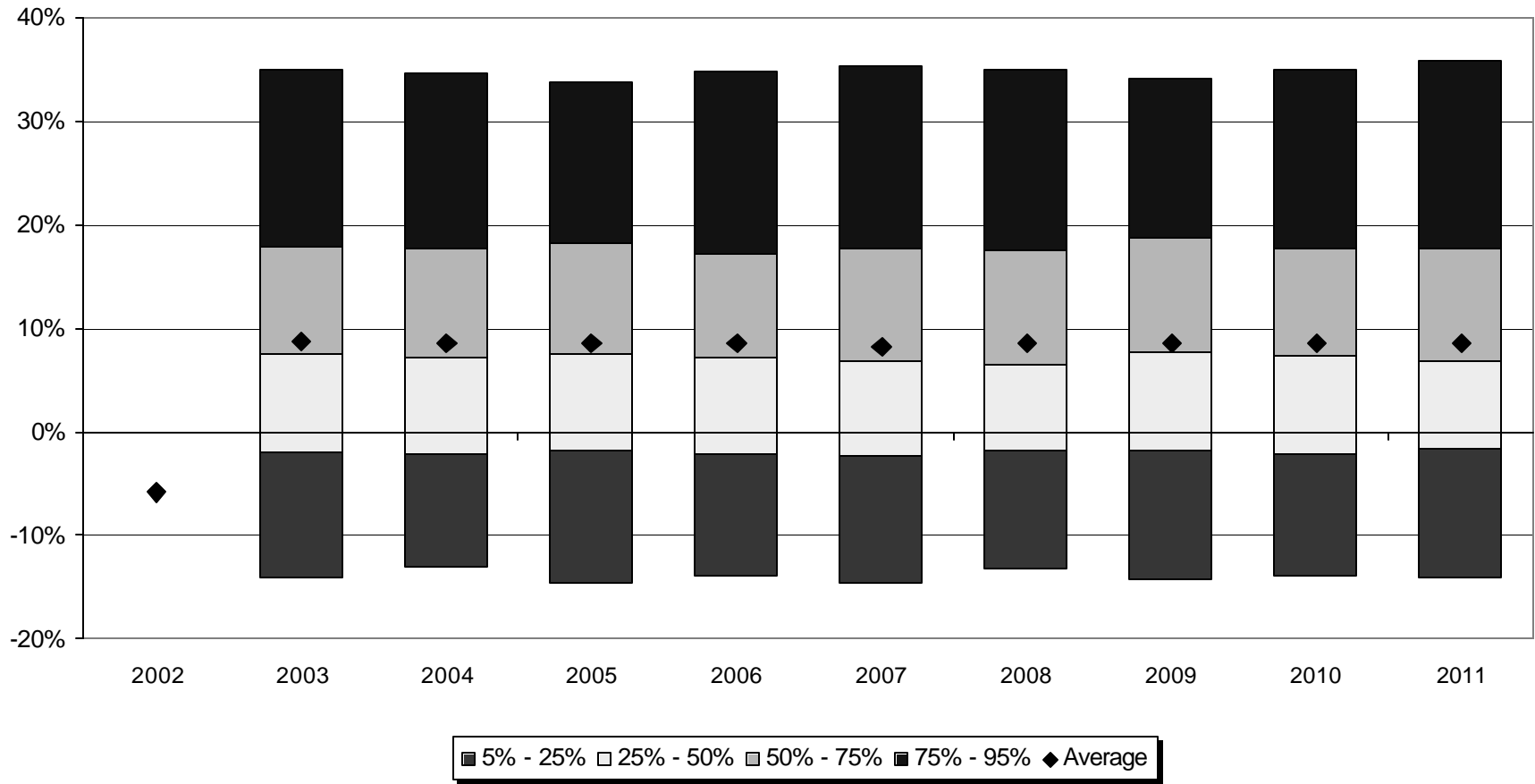
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- Investment returns of policy portfolio
- Actuarial Funded Ratio
  - Actuarial Obligation, divided by
  - Actuarial Value of Assets
- 30-Year Contribution Rate
  - Normal Cost Rate, plus
  - 30-Year amortization of Unfunded Actuarial Obligation



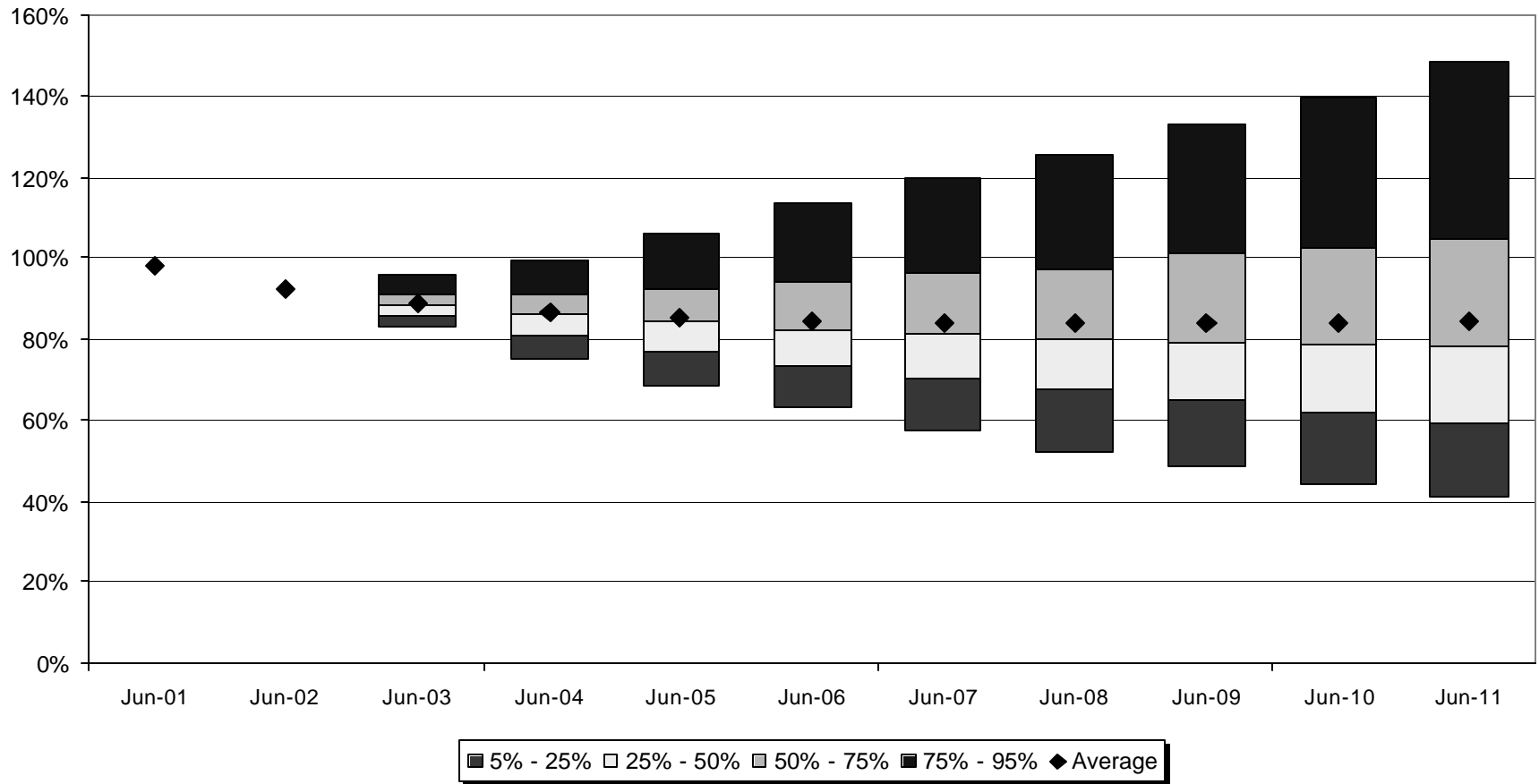


# *Projected Returns: Scenario 1*



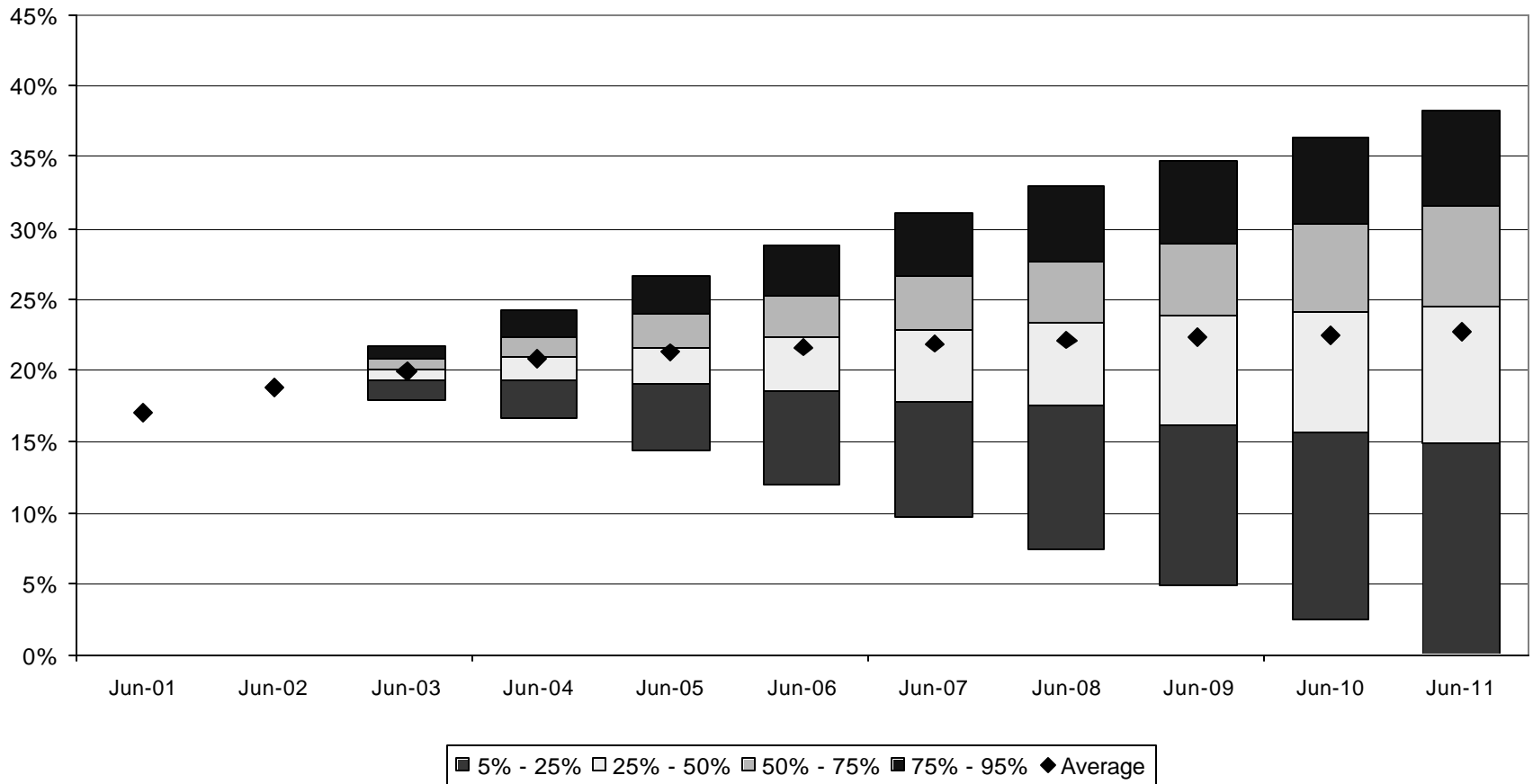


# *Funded Ratio: Scenario 1*



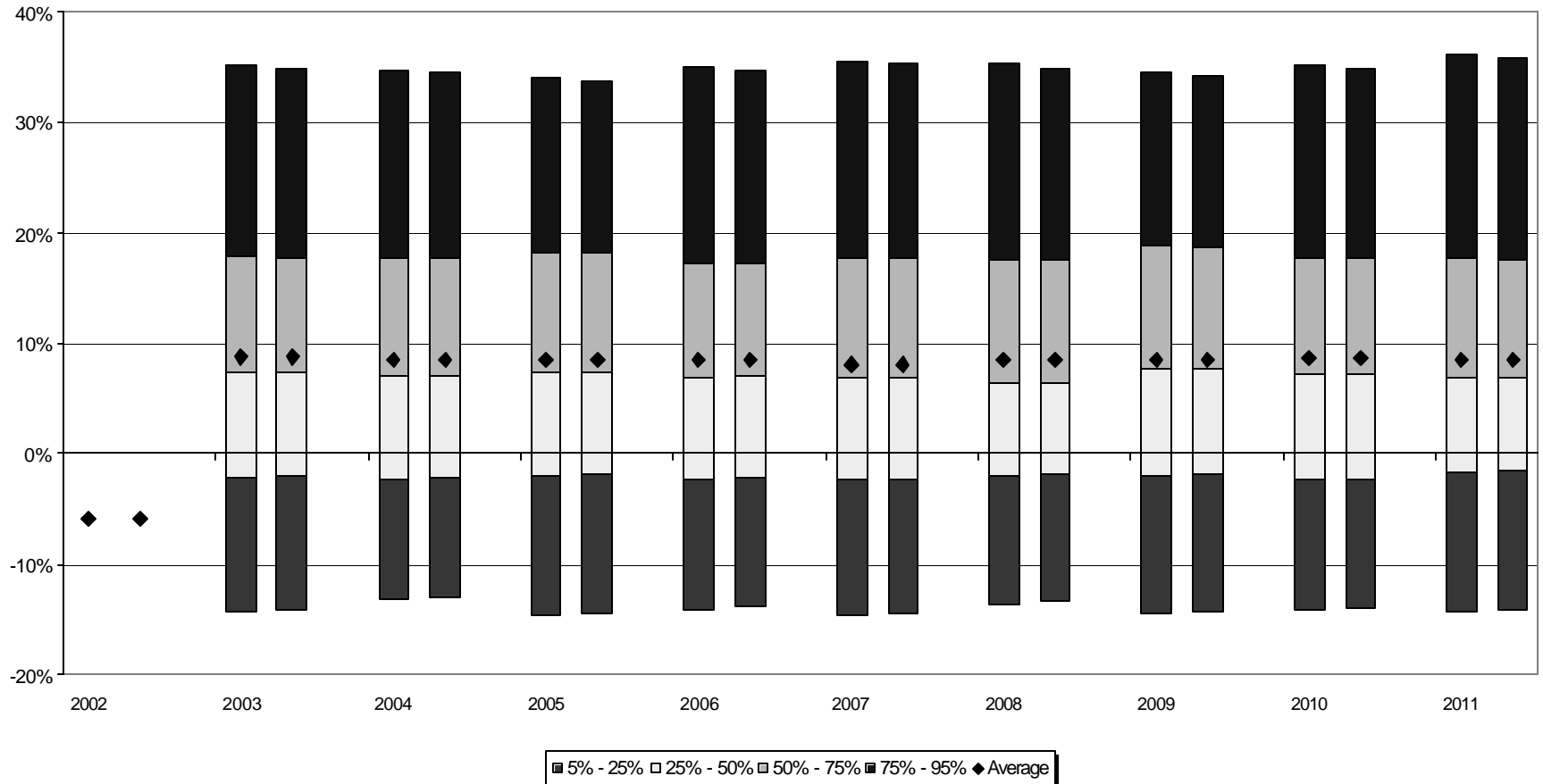


# *Contributions: Scenario 1*





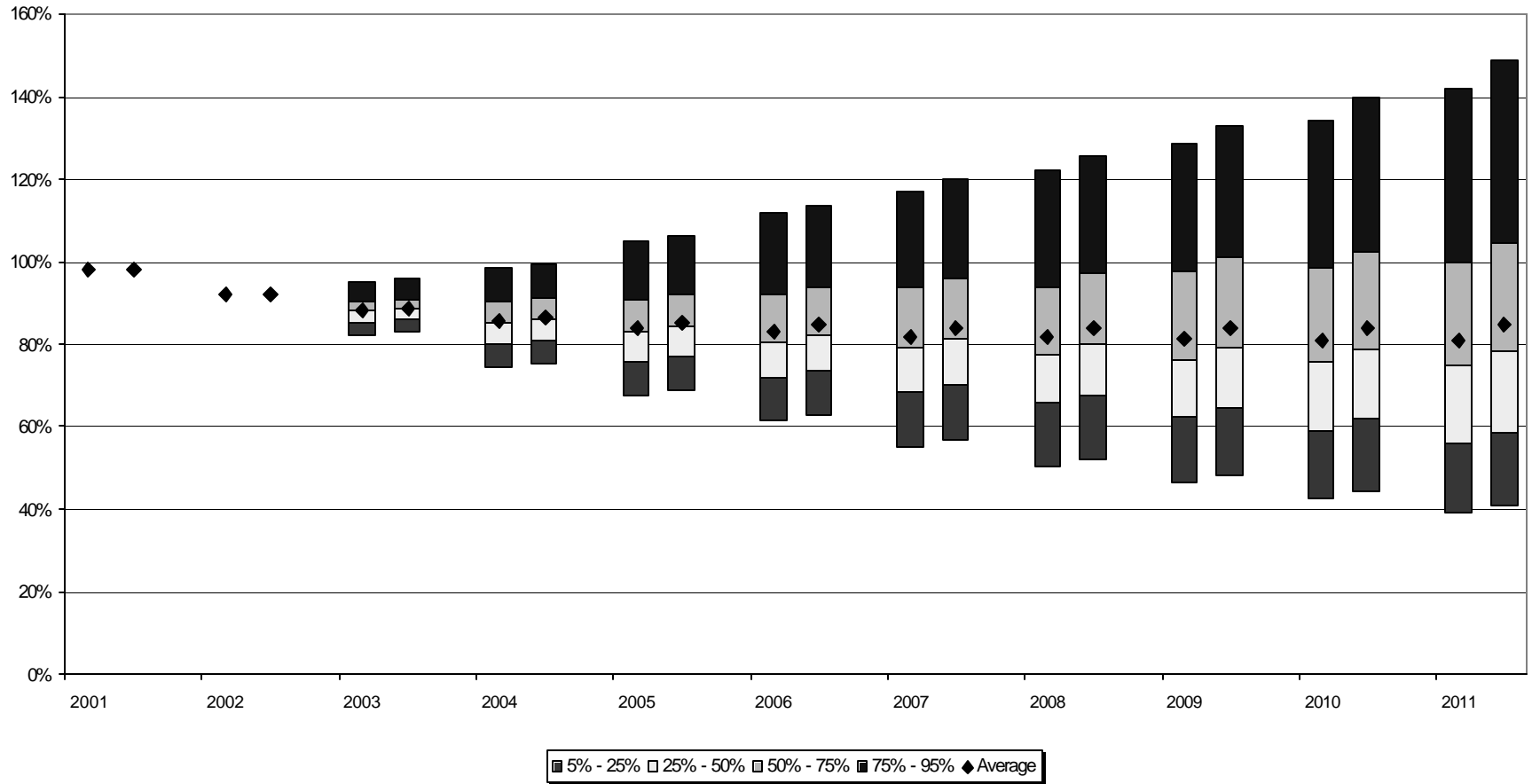
# *Proj Returns: Scen 2 vs. Scen 1*



*Bar on the right side represents Scenario 1.*



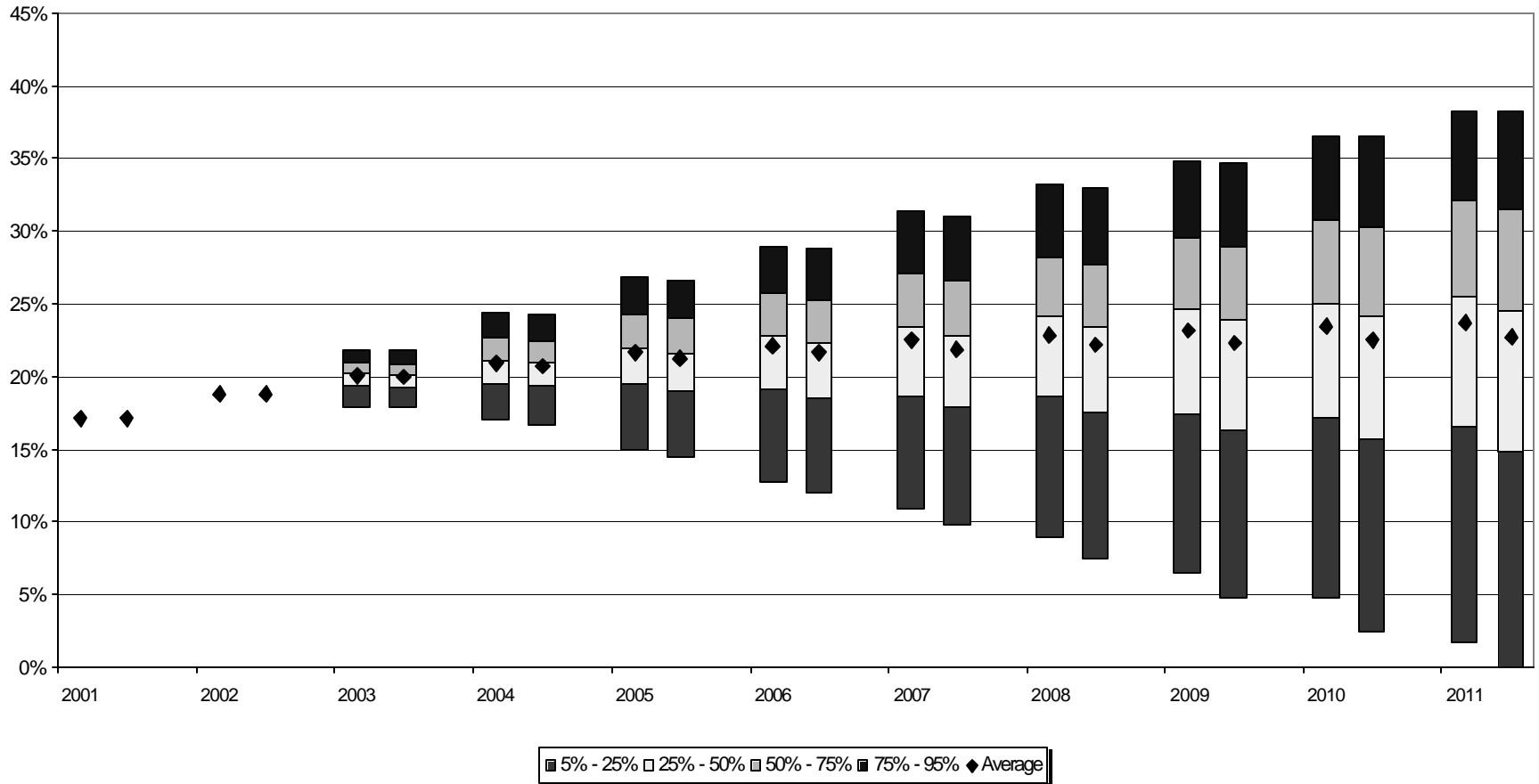
# *Funded Ratio: Scen 2 vs. Scen 1*



*Bar on the right side represents Scenario 1.*



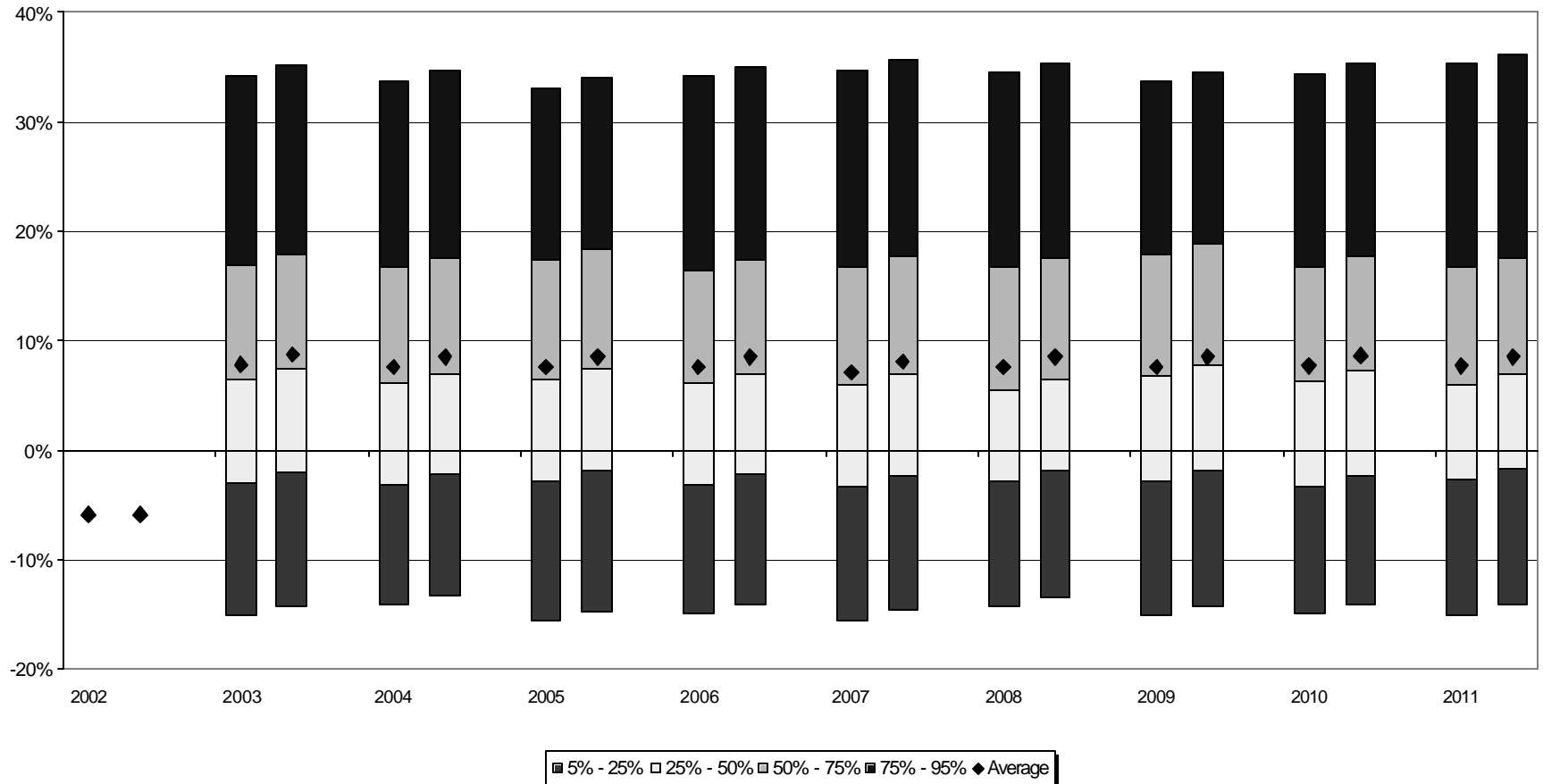
# Contributions: Scen 2 vs. Scen 1



*Bar on the right side represents Scenario 1.*



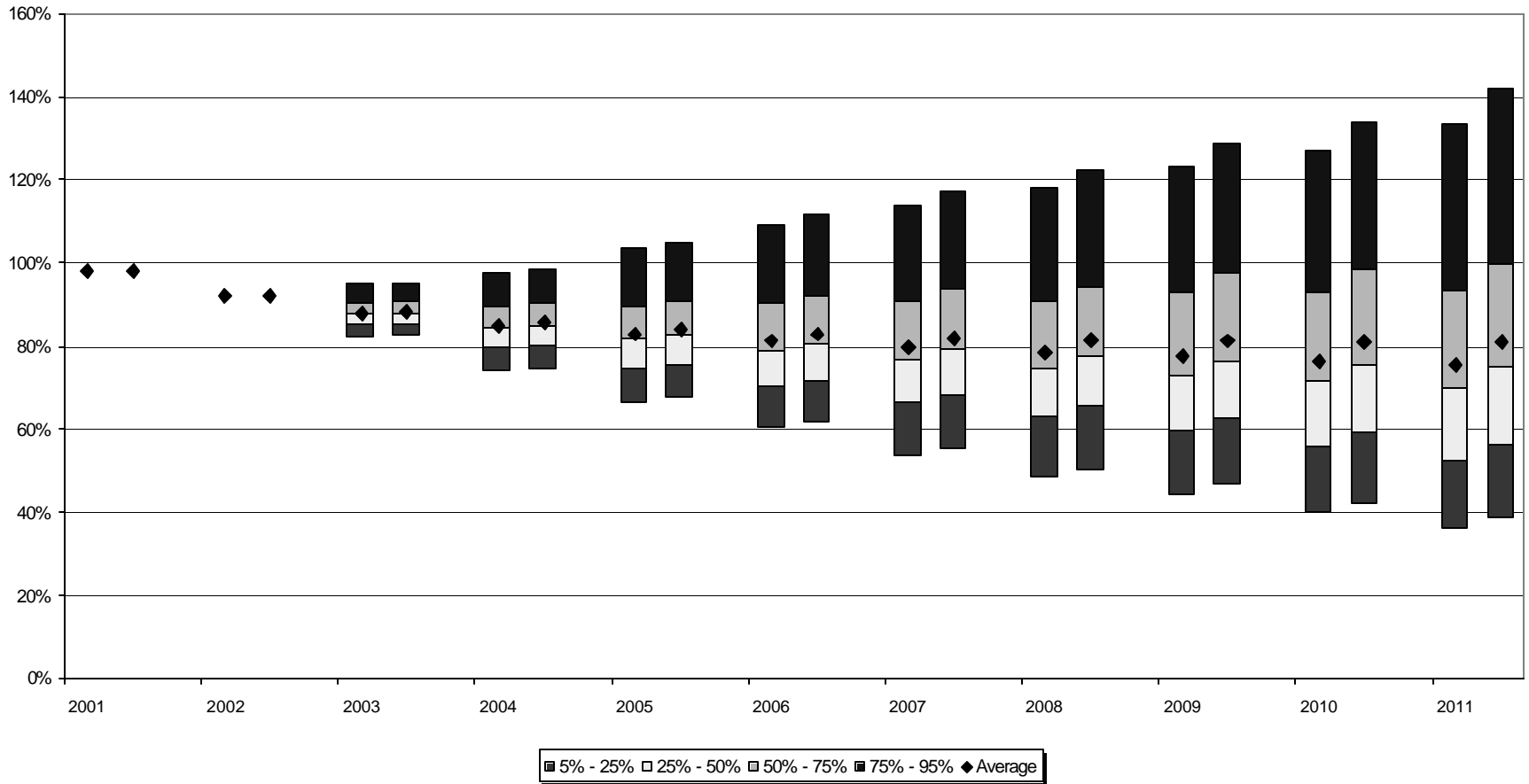
# *Proj Returns: Scen 3 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



# *Funded Ratio: Scen 3 vs. Scen 2*

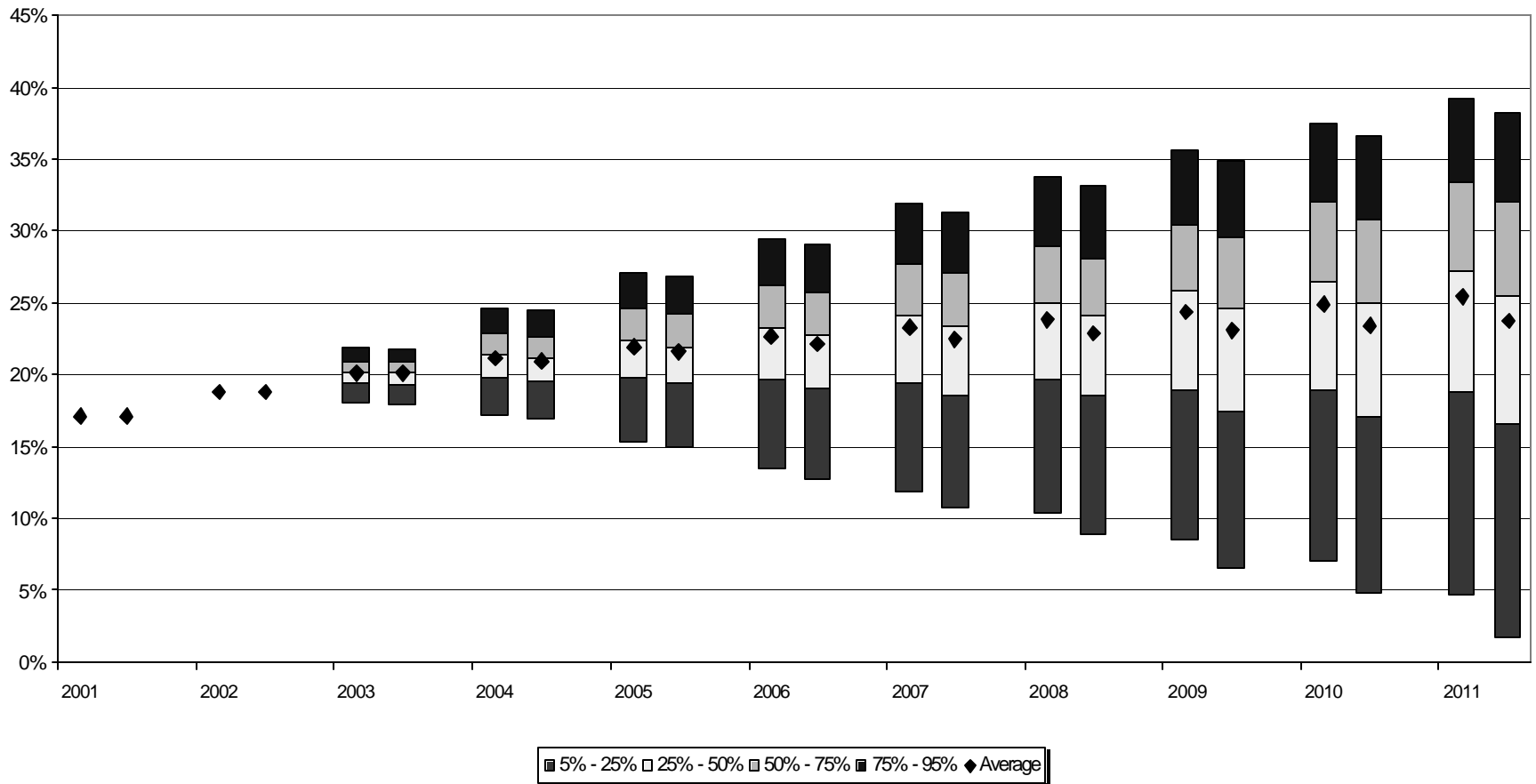


*Bar on the right side represents Scenario 2.*





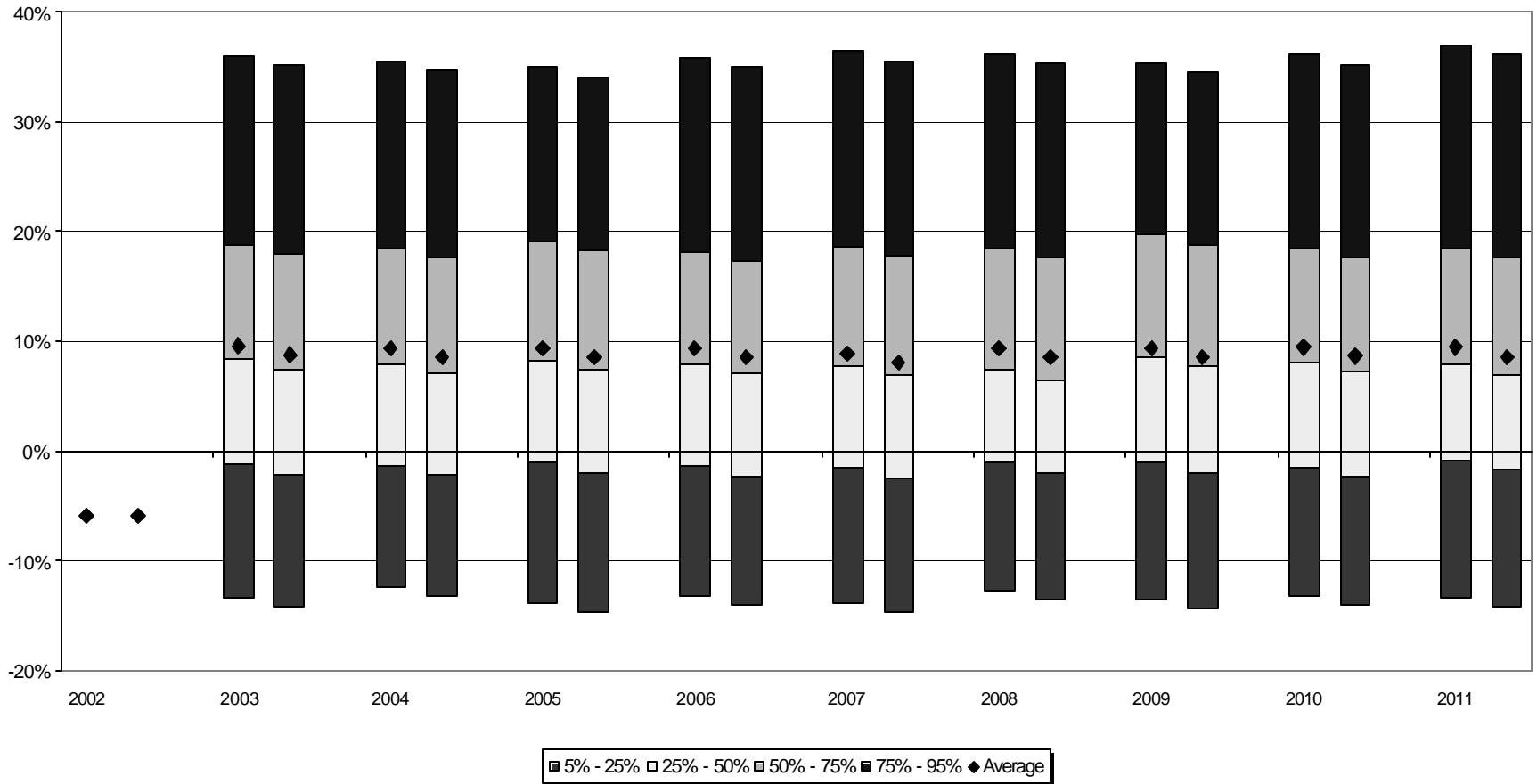
# *Contributions: Scen 3 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



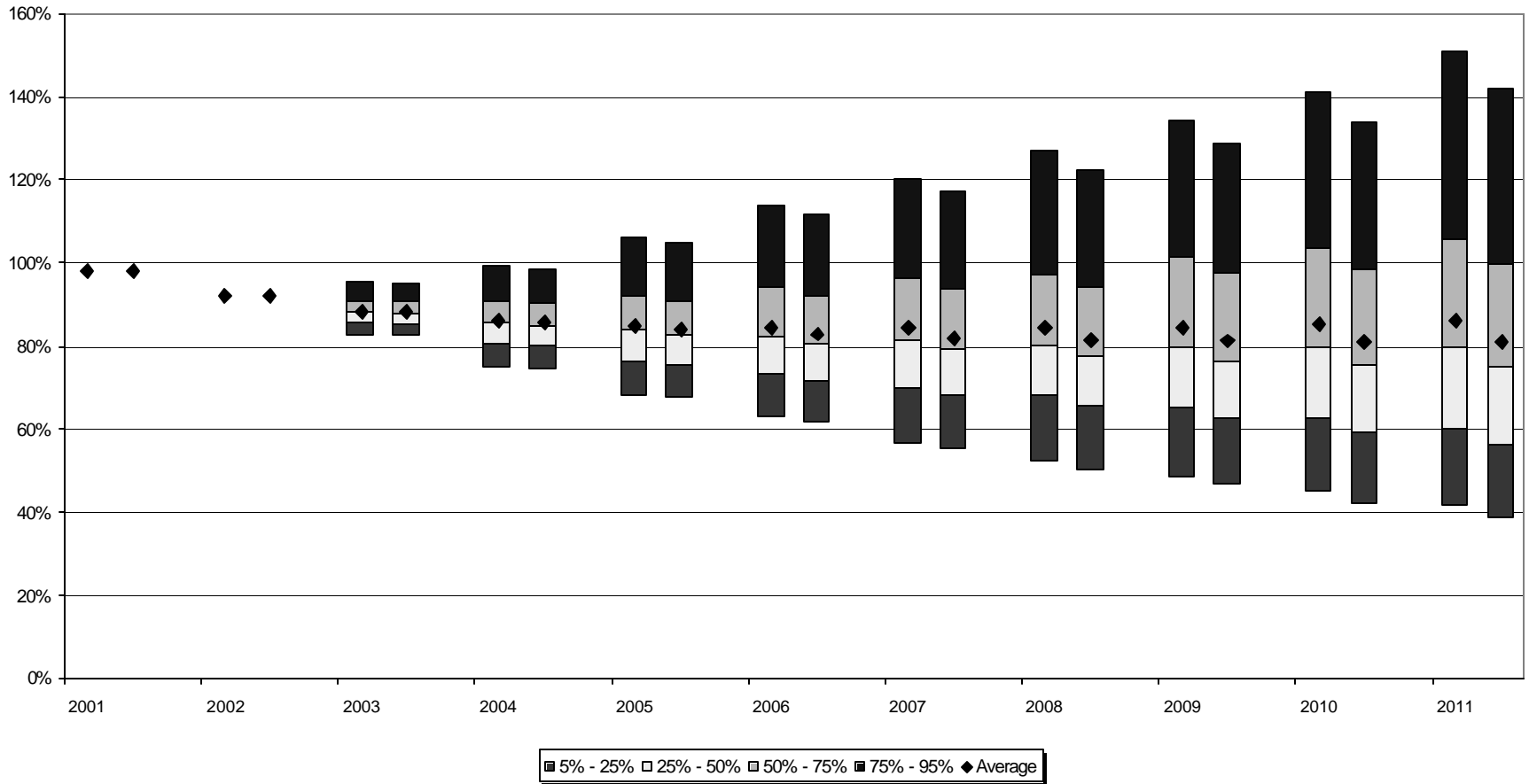
# *Proj Returns: Scen 4 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



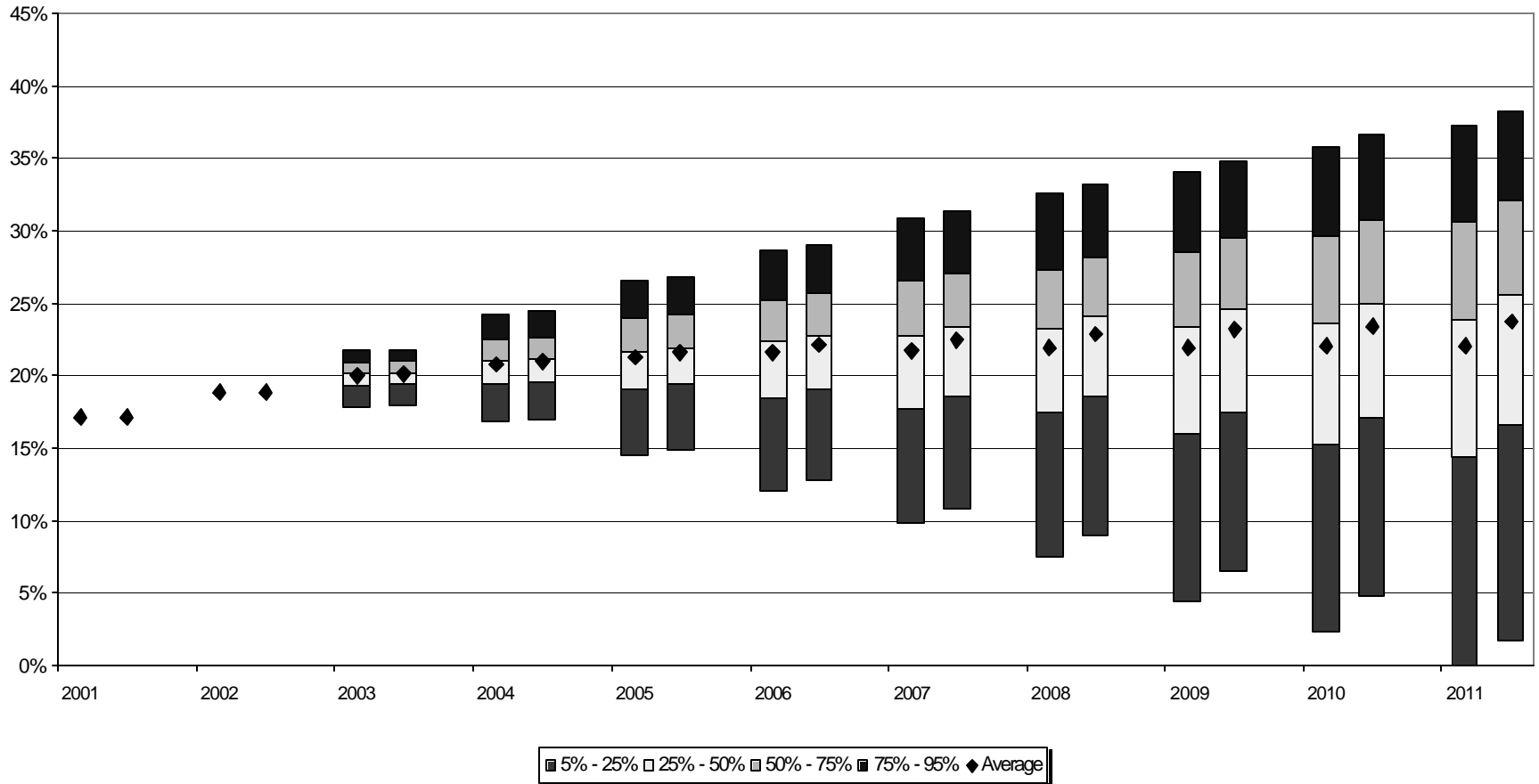
# *Funded Ratio: Scen 4 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



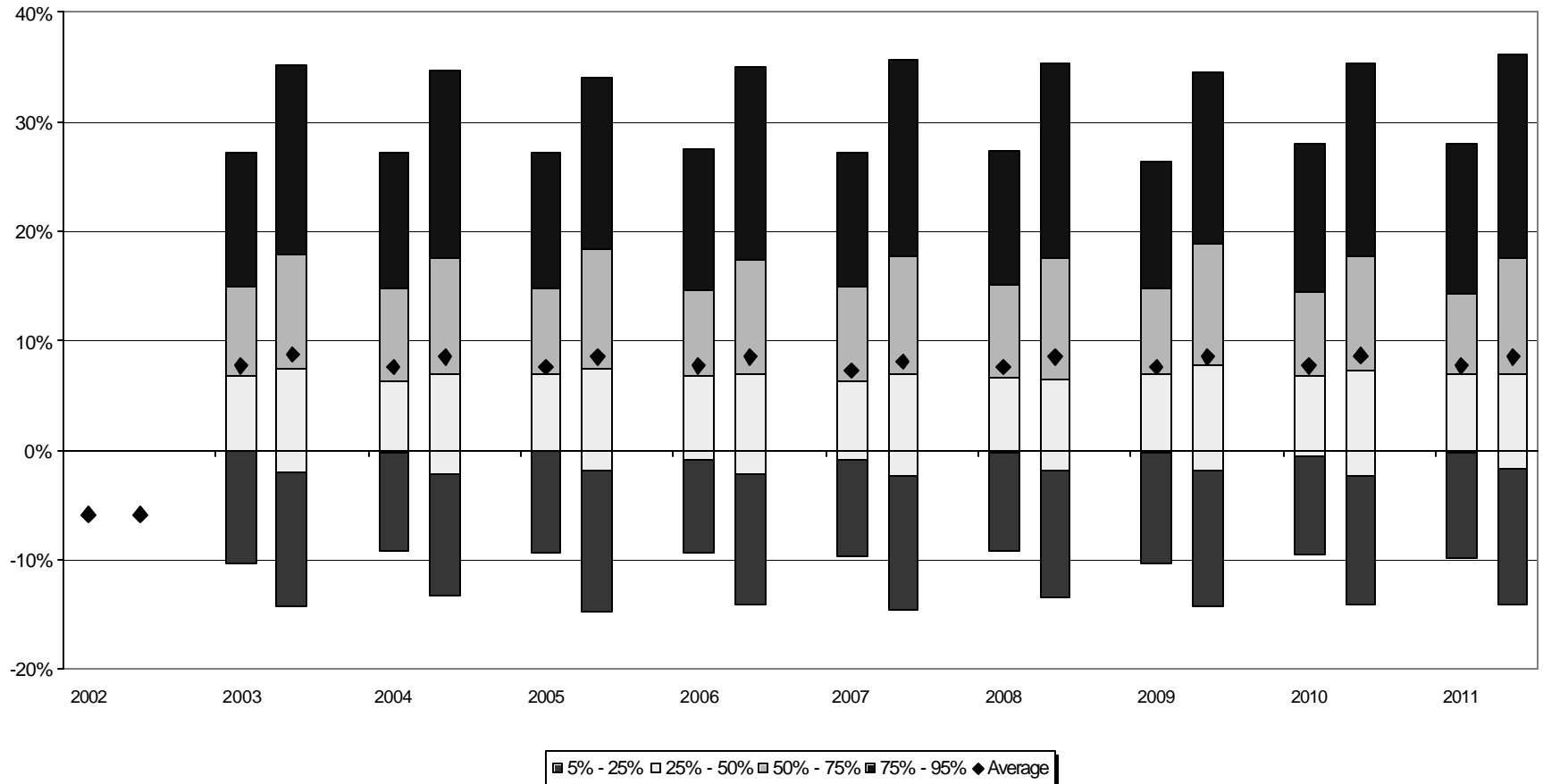
# Contributions: Scen 4 vs. Scen 2



*Bar on the right side represents Scenario 2.*



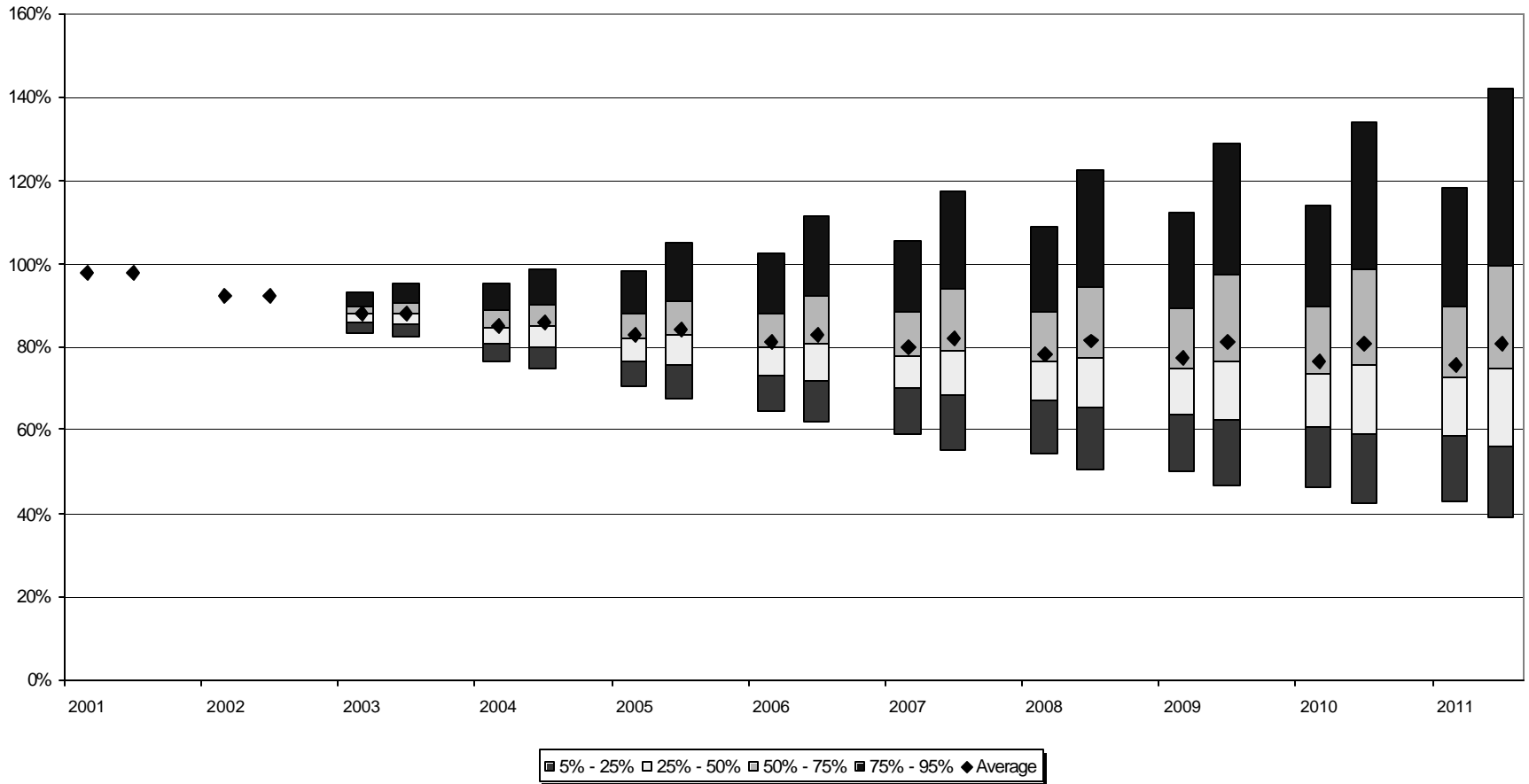
# *Proj Returns: Scen 5 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



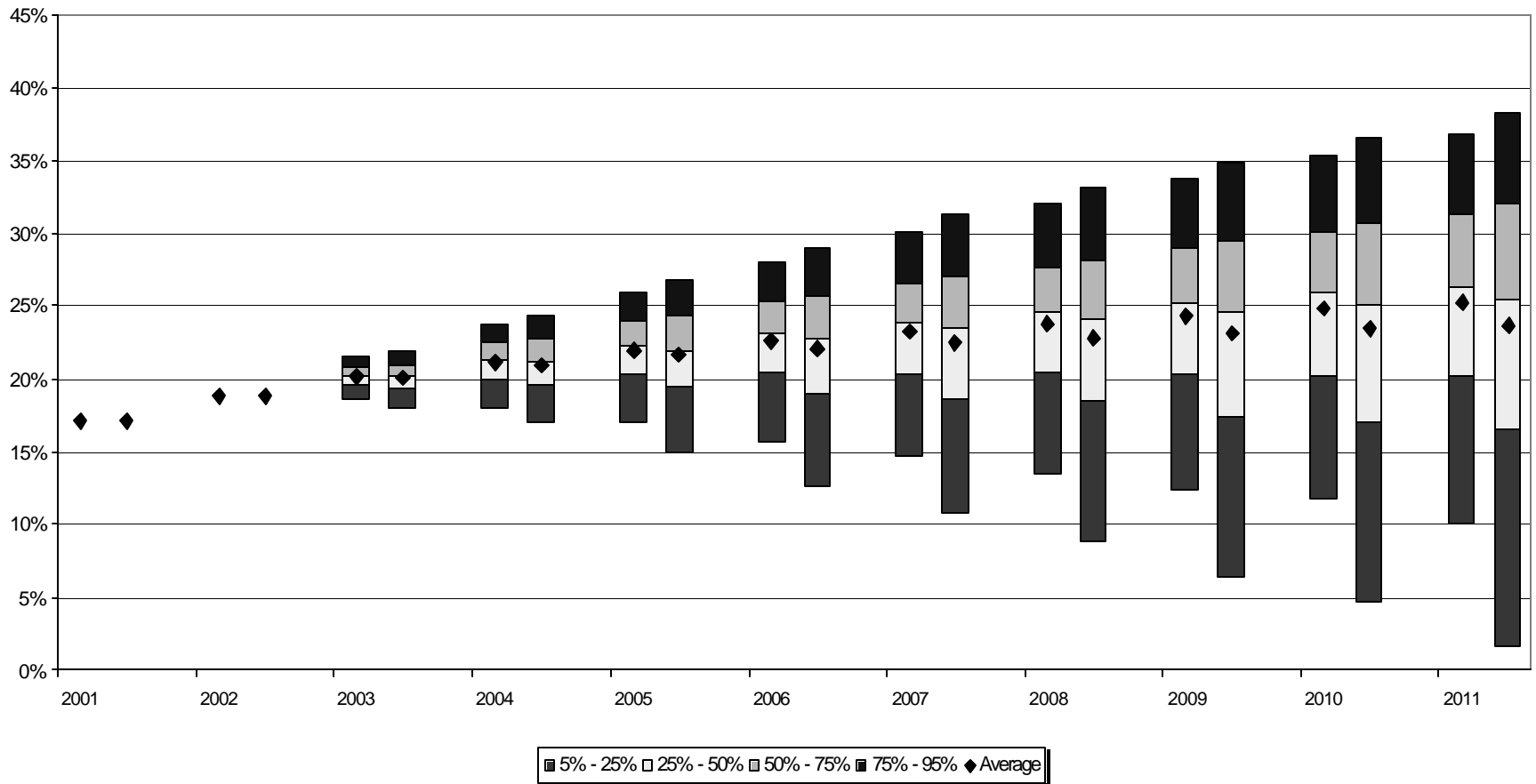
# *Funded Ratio: Scen 5 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



# *Contributions: Scen 5 vs. Scen 2*



*Bar on the right side represents Scenario 2.*



# *Future Parts of the Study*

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- Test Asset Allocations
  - Re-run Stochastic Model
  - Selected asset allocation scenarios
- Decisions
  - Future Asset Allocation Policy